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Review

# "Boil before consumption". Lessons to learn from the risk (mis)management case of raw milk in Italy

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«Da bollire prima di consumare". Lezioni di (cattiva) gestione del rischio, il caso del latte crudo in Italia»

**Summary.** In 2008, a media crisis flared up and the issue triggered a prolonged "food scare": raw milk was blamed as the cause of several cases of Haemolytic Uraemic Syndrome (HUS) due to shiga-toxin producing strains *Escherichia coli*, which are highly pathogenic and sometimes lethal in children. The immediate response of the Minister of Health was an urgent decree, that ordered to report "raw milk: to be boiled before consumption" in front of the distributors in red-characters and with a defined size. Therefore, instead of reassuring consumers, this warning appeared as the admission that milk was unsafe, and a confirmation that there was a real food safety problem out there. Scope of the present article is to highlight how the risk-management cycle developed, departing from the media framing of the issue. The lack of time (5 days passed from problem recognition to risk management measures) resulted in an over-conservative yet effective policy option, but at the expense of farmers, blamed of selling dangerous milk. Results suggests that there was an inverted policy-making cycle, in the try to reassure the citizens while providing a protective risk management (and at the same time allowing raw milk sales to continue, even if under rigid conditions). We consider how the framework given by the media conditioned strongly the policy measures undertaken, limiting a wider set of policy options and suggestions

**Key words:** Media framing, scientific controversies, Raw milk, direct sales, *E. coli* 0157, risk management

**Riassunto.** Nel 2008, una crisi mediatica è divampata in Italia, con il conseguente innesco di un prolungato "allarme alimentare": il latte crudo è stato accusato di diversi casi di Sindrome Emolitico-Uremica (SEU), causata da ceppi batterici di *Escherichia coli* produttori della tossina Shiga (ECST). La sindrome è altamente patogena e talvolta letale nei bambini. La risposta immediata del Ministro della Sanità è stata la pubblicazione di un decreto d'urgenza, recante l'ordinanza di apporre, di fronte ai distributori in rosso-caratteri e con una dimensione definita- la scritta "latte crudo: da bollire prima del consumo". Di conseguenza, anzichè rassicurare i consumatori, questo avviso è apparso come l'ammissione che il latte era pericoloso, e la conferma di un preesistente problema di sicurezza alimentare. Obiettivo del presente aritcolo è quello di sottolineare come si sia sviluppato l'intero ciclo di gestione del rischio, a partire dalla cornice mediatica che è stata data ai fatti. La mancanza di tempo (soltanto 5 giorni sono passati dal momento della ricognizione del problema alle misure di gestione del rischio) ha dato luogo ad una risposta che, sebbene iper-cautelativa, si è dimostrata efficace, ma alle spese degli allevatori, accusati di vendere latte "pericoloso". I risultati suggeriscono che ha avuto luogo un ciclo invertito del risk management, nel tentativo di rassicurare i cittadini mentre si forniva una adeguata protezione (e consentendo al contempo una prosecuzione delle vendite di latte crudo, sebbene sotto rigide condizioni). Di conseguenza, gli autori considerano come il contesto cre-

ato dai media abbia fortemente condizionato le misure di policy adottate, limitando un più ampio spettro di opzioni di policy.

**Parole chiave:** Rappresentazione mediatica, controversie scientifiche, latte crudo, vendite dirette, *E. coli* 0157, gestione del rischio

## Introduction

In recent years the phenomenon of raw-milk sales in Italy has attracted wide coverage by the media, giving rise to supporters and opponents on the basis of different values and preferences, as it happened with other issues at the forefront of a deeper science-society confrontation (GMOs, nanotechnologies, pesticides, etc) (1). This novelty was perceived by the consumers as an opportunity for savings, while establishing eco-friendly, short chains of food distribution, in line with emerging values of the post-materialistic society (2). On one hand those advocating the return to the nature and to community-based economic relationships (3), even arguing for better organoleptic and also nutritional qualities of raw milk ("back-to-nature party"); on the other, the advocates of heat treatment as the ultimate measure to control bacterial contamination and consequent public health concerns ("Russian roulette party").

The raw-milk issue has received some interest by the academic community too, mainly stressing the emergence of different values and hence the "multilevel risk-benefit analysis"(4). This implies that consumers are at least partially aware of the risks they run in consuming certain foods, but balance these risks against perceived benefits, under strictly personal evaluation, which does not match with the univocal grammar of the life-sciences.

At the same time, research demonstrated how tacit, implicit food safety knowledge can be mobilized by conscious consumers in approaching food risk-management (5), despite inherent distance between subjective perception and objective risks (6).

Generally, consumers appear far from the optimal food safety knowledge necessary to carry out a "safe life" in the kitchen. Consumers seem to rely greatly on a number of heuristics and simplified cognitive models making them able to survive in most cases, by adopting "good practices", even when lacking a deeper, more formalized and conscious understanding of *what they mean* in terms of food safety.

The aim of this contribution is not to go through the risk-assessment component of the story, but to go back to the risk management cycle started in 2008, to reconsider the whole gestation and bias that led to a sub-optimal policy, and before that, the regulatory provisions that allowed the sale of raw milk.

## Raw milk sales in Italy

Following Reg. CEE 1411/1971 (7), Italian law 169/89 (8) forbade raw milk distribution, except for milk sold directly by farmers exclusively on farm. However, due to the evolving regulatory scenario at the EU and national level selling raw milk from automatic distributors became possible in Italy in recent years. Adaptation of Reg. (EC) 853/2004 (Whereas 24 and art. 8) (9), left Member States free to permit the sale of raw milk in other ways, under strictly ruled hygienic conditions.

Specific requirements of safety and hygiene were to be guaranteed to this purpose, beyond those required to farms not selling raw milk. This implied that also self-control plans were needed, accompanied by official veterinary checks on microbiological parameters. In particular, Section 9 of Reg. 853 sets rigid hygienic requirements, whereas in any case checks are risk-based -the higher the risk, the more frequent the sampling plan. On 25$^{Th}$ January 2007, the Conferenza Permanente per i Rapporti tra lo Stato e le Regioni (a collegial organ charged to draft guidelines on policy implementation and interlink between central and re-

gional administrative levels) gave guidance to sell raw milk for human consumption and to harmonize legislation. From that moment, raw milk could be sold both on farm and by automatic distributors.

The entire milk chain management was prepared with a clear focus on organizational and analytical aspects. Specifically, the regulation framed a direct responsibility of the farmer selling the milk (as from Reg. EC 852/2004, art. 1) (10); under a clear traceability: the milk sold could come from only one farm -no cooperatives admitted. Milk distributors were built to respect food safety requirements for selling raw milk and needed to be recorded and monitored constantly by inspections (minimum, twice a month in Lombardia Region -but requirements differ depending on administrative levels of competence). All this contributed to strict hygienic conditions (cold chain maintenance, i.e., temperature at milking, temperature at storage, number of microbiological test, etc), with a bacterial charge at 30 °C below the value of 100.000 cfu; and the count of somatic cells per ml below 400.000. Notably, these values are the same of pasteurized milk according to the Italian Law 169/1989.

In a short time, 1100 milk distributors (Coldiretti data) appeared on the Italian landscape (2004-2007) for an estimated market share between 4 and 6% of overall milk sales, equivalent to 80,000 liters on 1 ,230,000 of overall daily sales (Coldiretti estimation). A clear economic incentive for both producers and consumers was behind this. Producers which received c.a. 0.25 euros per liter of milk under traditional industrial contracts, could improve their revenues, selling at about 1 euro; consumers could save 20-40 cents/liter (compared to 1, 20/1, 40 euros at the retail). This was a clear win-win situation, with advantages to both extremes of the food chain. However, market competition and weaknesses in the food-chain governance proved to be a ground for misalignment to optimal risk management conditions.

In particular, several concomitant factors conspired for a food scare emergence:

- Pathways of transmission of food-borne zoonosis are subject to weak evidence. It is clear that for zoonosis it is inherently difficult to find the "smoking gun" in case of outbreaks of disease. A clear evidence of this is the EFSA-ECDC Annual report on Zoonosis 2010 (as the most recent, EFSA-ECDC 2012) (11, 12), for instance, where the so called "weak evidence outbreaks" (those with not established causative link) are by far the majority of all reported outbreaks, regardless of the country considered. This leaves ground for media and public opinion debate more similarly to common police-investigation than evidence-based risk assessment. A similar episode was the German outbreak of *Escherichia coli* 104:H4 in 2011, eventually attributed to fenugreek seeds, but with Spanish cucumbers accused first. If precautionary measures -as well as good hygiene practices and all instruments able to control risks- are set on a strictly scientific ground (13), not questioned as such, the media debate can trigger a completely another frame of analysis.
- The lack of a governance system with intermediate private actors defining and controlling precise production standards (i.e., consortia) and acting as supervisor constituted probably a fault. Conversely, the absence of a collective milk sale (cooperatives) diminished the moral hazard of diluting safety standards among the producers. This moral hazard acts as follows: enterprise "A" is tempted to lower safety standards (and related costs) since in case of disease outbreak it can discharge the responsibility onto other enterprises (*private gains, shared responsibility*). On the contrary, in the absence of cooperatives, producers not fulfilling the food safety standard could be immediately identified, leaving to the single enterprises the burden of the proof ("sell and bear the risk of your milk"). However, the inherent frailty of the system, very sensitive to microbiological hazards and the short time for phasing-in of enterprises not used to sell raw milk constituted a shortfall retrospectively. A possible alternative could have been milk selling accompanied by a consortium-like governance, to maintain and control food safety requirements.
- The organization of public controls at regional level was not homogeneous, with Regions giving different guidelines and criteria (even microbiological).
- At the same time, the fierce opposition of industry and retail could constitute an incentive to reveal risks to the public opinion, to regain the market-share passed onto farmers. This has been stressed

among others by Beppe Grillo (14) actually leading the "Movimento 5 Stelle" party with 25% of political votes. Grillo revealed "wars" against farmers moved from industry and retail, in order to recover subtracted value once the food chain had been disentangled.

The major limits of risk management plans were that: a) there was an high reliance on self-controls and declarations, with less presence of official controls; b) some pathogens may not be detected under routine sampling, due to their intermittence or limited presence (the *E. coli* 0157 belonging to this group); c) pathogen presence at the time of sale could increase drastically under particular conditions (temperature increase in lack of adequate storing) (15). Furthermore, discrepancies in official controls at regional level allowed the later recognition of safety aspects. In particular, guidelines for effective risk management and official sampling were different.

## Method

A media content analysis was performed by two trained experts, in the aftermath of the first article from "Il Riformista". In fact, this article acted as a starter, blowing up a "bandwagon effect" and triggering attention from the public authorities and further mediatic debate in the following days. The media content analysis relied on newspaper journals only in order to tackle with the short timeframe, and was performed by in-depth, qualitative content assessment (16, 17). In particular, only national level and regional level daily newspapers were included. This is due to the presence of a nation-wide policy on milk sales and inherent debate had to be kept at the appropriate level of policy response. A preliminary scanning of the titles –subtitles allowed to consider all the pertinent articles, proceeding with an in-depth review of the pieces thereinafter. The researchers performed the content analysis, departing from-concepts and selecting the recurrent topics framing the emerging issue and contributing to the identification of internal narrative(s). The qualitative insight consented to overcome major limitations of a a strictly quantitative content-analysis (i.e., to limit the presence of a topic to recursive lemmas only).

The analysis occurred between 3 and 8 of December (date by which the Minister proposed a decree regulating the matter) and evidenced many agreement points emerging from the different sources. A total of 16 national and regional newspapers[1] gave room to the issue and several "hot spots" of interest on risk related aspects of raw milk production and distribution/consumption could be identified. Two topics were largely agreed upon by all media: the intrinsic risk of raw milk (13 articles out of 16, topic 11 in the table 1) and the lack of info to the end-consumer on correct management and storage options (12 articles out of 16, topic 1 in the table 1). This last aspect in particular could have been used to frame a number of policy options alternative to the ones deployed eventually. One source out of four (4 articles out of 16, topic 2 in table 1) also stressed the lack of sufficient controls along several point of the distribution chain (including milk vending-machine). Three out of 16 highlighted the lack of correct behavior adopted by consumers, showing the potentially positive role of information to change the approach to raw milk use (topic 7). A graphical outline of the issues covered in the different media is presented in Figure 1.

## The media mis-management

In 2008, a media crisis was out starting from the daily "Il Riformista" (Fig. 2) (18) and the issue gained the agenda of national and local press/broadcasting. Raw milk was blamed to be the cause of several cases of a disease caused by the O:157 strain of the bacterium *Escherichia coli*, which is highly pathogenic and with possible fatal consequences in children. In particular, the so-called "Legnago case" took momentum, with the assumption that a 3 year-old female baby underwent renal failure due Hemolytic-Uremic Syndrome (HUS) and was hospitalized for 12 days. The case received wide media magnification, due to emotional aspects of "wounded childhood", even if never confirmed by official sources.

Conditions of production, storage and transport of raw milk were accused of lacking respect of hygiene requirements, and most of all, of lacking the

[1] Articles as retrieved from Coldiretti database on newspaper, during the days from 4 to 8 December.

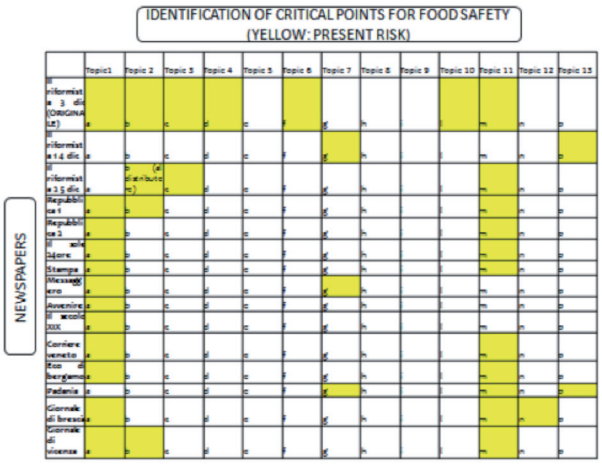


**Figure 1.** Critical points for food safety as perceived by daily newspapers.


il caso
Latte crudo, la moda porta in ospedale
ADDIO PASTEUR. L'ultima tendenza è bere latte non pastorizzato. A Legnago una bimba di tre anni è stata dodici giorni in terapia intensiva per aver contratto l'Escherichia coli. Purtroppo manca una normativa chiara delle regioni in materia.
BOND, 007 CON LICENZA DI BERE LATTE.
milk

**Figure 2.** The article focusing on a dismissed case of 3 years old child hospitalized.

pasteurization procedure as a general mean to eliminate the presence of bacterial pathogens. As an immediate response, the Minister of Health ordered by an urgent decree, to state "Raw Milk: To Be Boiled Before Consumption[2]"in red characters in front of the distributors and with a defined font-size. This is currently in place and was resumed by a successive decree (D.L. 158/2012)(19): confirming also the ban of raw milk distribution to caterers and schools.

The article that triggered the risk-management cycle was on press on December 3, 2008, focusing on the "Legnago case" and the 3 year-old child. What is relevant is that the local competent health authority (ASL) discarded and later excluded the responsibility of raw milk (Table 1). In 5 days, the response of the Minister of Health was delivered, completing the risk management cycle (December, 8, 2008).

Even if the news was not confirmed scientifically nor legally, the media outbreak took autonomous propagation and life. This can be explained by the well known bandwagon effect (20), group thinking of the journalistic community (prone to information cascade) (21, 22), agenda setting properties (once established, a news can continue living, and also re-bounce on other sources) (23). Apart from communication, theory, sociological insights take to the same conclusion, considering a communication sphere soon separating from the social subsystems from which the news derive (24) and acquiring emergent, autonomous traits. Furthermore, a strong tradition of "fact-checkers" is not present in Italy as in other countries, assessing facts on the field and verifying data provided in the news. This allows unconfirmed news to arrive easily on the board of newspapers and to be diffused widely.

However, all this was possible also due to the presence of a "grey area" of scientific uncertainty, according to the principle "it cannot be excluded". In fact, 24 confirmed cases of infections by verocito-toxic *Escherichia coli* (among which, 7 of O157) were officially reported in Italy in 2008 (11) (EFSA-ECDC, 2010) (<0,1 on 100,000 persons, at the lowest EU levels), with 9 cases of HUS. Therefore, even if officially no demonstration of milk involvement in such cases was available, the link was to some extent *plausible*. This paved the ground for a conservative response. It is worth noting that hygienic conditions of raw milk were controlled and rated as good by the veterinary services (25-27).

## Risk management aspects

The media outbreak started by "Il Riformista" newspaper was followed by 4 days of journalistic reportages on the issue (from 4 to 7 December 2008),

[2] Ordinanza del Ministro del Lavoro, della Salute e delle Politiche Sociali concernente:" Misure urgenti in materia di produzione, commercializzazione e vendita diretta di latte crudo per l'alimentazione umana" http://www.salute.gov.it/imgs/C_17_primopianoNuovo_208_documenti_itemDocumenti_0_fileDocumento.pdf

**Table 1.** Results of official monitoring plan on raw milk in Lombardia Region.

| Monitoring plan | | 2007 | 2008 |
|---|---|---|---|
| | N° samples analysed | 1970 | 1423 |
| Bacterial count | % < 25.000 cfu/ml | 85,8 | 91,4 |
| | % > 25.000 cfu/ml | 14,2 | 8,6 |
| Somatic cells count | % < 300.000/ml | 82,5 | 91,9 |
| | % > 300.000/ml | 17,5 | 8,1 |
| Inhibitory substances | % Negative | 99,9 | 99,5 |
| Thermotolerant Campylobacter | % Positive coltures | 0,1 | 0,0 |
| *Listeria monocytogenes* | % Positive coltures | 0,4 | 0,4 |
| Salmonella spp | % Positive coltures | 0,2 | 0,2 |
| Verocitotoxic *Escherichia coli* | % Positive coltures | 0,1 | 0,0 |

many of them prompting a possible ban of raw milk sales in response to the alleged responsibility in the "Legnago case" (Fig. 3).

The urgent provision of the Minister of Health (emergency decree) on 8th December, 2008 reacted to an uncontrollable food-scare outbreak and

- required to report on milk distributors that milk had to be boiled before human consumption;
- demanded that such information should be clearly readable and in red characters, with defined font size;
- imposed a maximum term of consumption –the third day after being commercialized – to be displayed at the point of sale;
- obliged farmers to exclude the availability of glasses or similar containers suitable to drink raw milk *in locus*.


**Figure 3.** Titles of newspapers during the period 4-7 December, 2008.

Other measures were the ban of raw milk delivery in catering and food services. The decree was extended by virtue of the Law on Public Health of 13 September 2012, n° 158, Urgent provisions to promote the Country development by a higher level of health protection".

Notably, the measures adopted were not the result of a traditional risk-management. In fact, the risk management was not the result of a proper risk assessment (including hazard identification, hazard characterization, exposure assessment, and eventually risk characterization) (28, 29), due to the perceived urgency and lack of time to develop it (Fig. 4). As a

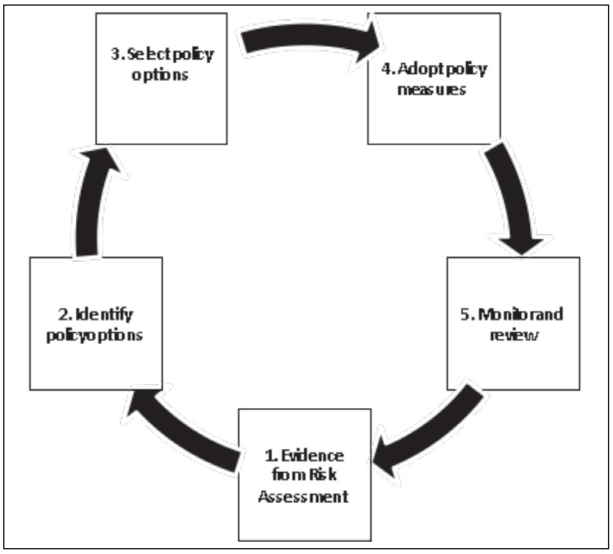


**Figure 4.** The basics of Risk management cycle.

replacement for a traditional, robust risk management cycle, the media-borne risk communication took the drive and resulted in an inverted risk-management decision process ("first communicate, then assess"). As a complementary shortfall, no policy alternatives were considered. This is crucial to RM, which can be outlined as "the process of weighing policy alternatives in the light of the results of risk assessment" (30).

In fact, steps 1, 2, and probably part of the 3 were not considered appropriately. An implicit consequence of this was that stakeholders were not included in the framing of policy suggestions, exacerbating mistrust in policy decisions neither perceived as fair nor authoritative. On the contrary, they were left to the ground of media communication, or private agendas and market competition to acquire market quotas of fresh milk.

## Conclusions

In conclusion, the following considerations can be advanced on the whole issue and the related risk-management cycle. Firstly, preventing cooperatives from acting as an intermediate link between producers and consumers probably stimulated producers to comply with the required hygienic standards thus limiting possible cross contamination between different milk batches from different producers. However, the presence of a consortium-like governance could have fostered complementary control interventions with respect to public veterinary services. In this way, higher hygienic standards could have been achieved, hence a more effective risk management. In addition, this could have had a role in helping harmonize public controls, which are organized on a regional basis, with a better and more fruitful dialogue between single milk producers, and veterinary services, dialogue which that probably lacked to some extent.

Secondly, this was a clear case of non "evidence-based" policy making. The timeframe precluded an in-depth risk assessment, due to the urgency for a response. The decision-making process seemed closer to the "garbage can" model (31), inside which a casual, cumulative implementation of a range of policy measures strongly rely on circumstances at the intersection of the events. This may appear striking considering the scientific ground on which the issue was set, and the methodological rituals adopted by the scientific community which should never forget that traditional policy considerations can take the drive even on scientific issues.

Thirdly, the policy response proved to be effective but not efficient. The risk-management cycle really took place under critical time constraints and it resulted in a conservative yet sub-optimal response, protective enough for consumers but not for the principal stakeholders. No alternative policy options were properly considered and balanced and the perception was a "war for the market" among the different actors of the supply chain. Anecdotal evidence shows that milk prices at retail after the media scandal- rose from 1 euro/liter to 1,15-1,20 euro/liter, reflecting the fierce competition for consumers' grabbing. An efficient policy-making could have required both an inclusive approach with respect to stakeholders, and a more targeted policy action. In particular, considering that HUS is mostly reported between 0 and 15 years of age (90% of cases) with 80% of cases from 0 to 6 years (Istituto Superiore di Sanità data), precautionary messages could have been specifically addressed to this part of consumers, promoting a better awareness of the risks posed by raw milk. This is a typical case of "long-tail" distribution phenomenon, where a limited sub-group of the population accounts for the major part of the risk. The "long-tail" approach, made popular by Chris Anderson (32) found support in a number of policy-making settings, from the homeless care services in the United States, to the policies targeted to HIV transmission -identifying sub-groups of the general population being particularly at risk (33).

Fourth, risk communication virtually went on as an abstract and separate issue from risk assessment and risk management. The media drove the management cycle process, framing the options and revealing the artificial, cultural nature of risk-management as such, attributing different value to different risk sources. Hence, even if a food safety issue could not be discarded at all (in the end, raw milk is a plausible source of *E. coli*), the spotlight was pointed to raw milk as the cause of HUS. Raw or undercooked meat accounts for most of the known cases of HUS due to *E. coli* 0157. But no compulsory notice indicating to cook meat for at least 120 seconds

at 70° (or equivalent combination of time/temperature) is present at retail. This is consistent with previous literature, where risks seem defined, perceived and managed according to principles that inhere in particular forms of social organization (34, 35).

Fifth, the counter-intuitive, unintended consequence of the adopted risk-management option was to scare the consumers even more. The message "TO BE BOILED BEFORE CONSUMPTION" on distributors generated fear and disaffection among consumers, with a drop in sales of an estimated 40%-50% in volumes (Coldiretti data and anecdotal evidence). At the same time, in the period 2007-2008 there was an increase of raw milk price, recovering the previous value at retail.

Eventually, this can be considered a clear case of "emerging risk", according to the recent EFSA's definition: "a risk resulting from a newly identified hazard to which a significant exposure may occur or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard" (36). Specifically, here the emerging risk seems to be due to an increased exposure to a known microbiological hazard, in response to a "cultural shift" in the use of milk. *Cultural shifts* are recognized by EFSA as a driver of emerging risks, as they can increase the exposure or susceptibility to known hazards. While in the past lay people used to heat-treat raw-milk directly sourced from the farmers, after the pasteurization-era all this common sense behaviour has been forgotten with the consolidated attitude to rely primarily on industrial treatments. But the reintroduction of "raw milk" distribution in response to a new consumers' demand ("cultural shift") was not accompanied by appropriate education and information to the consumers who had to manage potential risks without adequate mind-set. Furthermore, the whole story shows that a parallel driver for emerging risks may be the lack of correct application of risk assessment knowledge inside the risk management procedures. The pathogens were known both in their frequency and in impact, and despite this the "bureaucratic management" gave the false impression of an overall control of the risk(s).

This represents another clue to confirm the relative nature of the "risk" and hence risk management cycle. Not to dismiss the evidence, but on the opposite, to tribute the fair role to management issues often at the end of the production process, and just before consumption. In absence of a critical appraisal and management from consumers, any food may become risky and uneatable.

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